HALO®

PCS

C18

PHENYL-HEXYL

CHARGED SURFACE TECHNOLOGY
FOR BASIC COMPOUNDS

HALO® PCS (Positive Charged Surface)

POSITIVELY EXCEPTIONAL RESULTS FOR BASIC COMPOUNDS

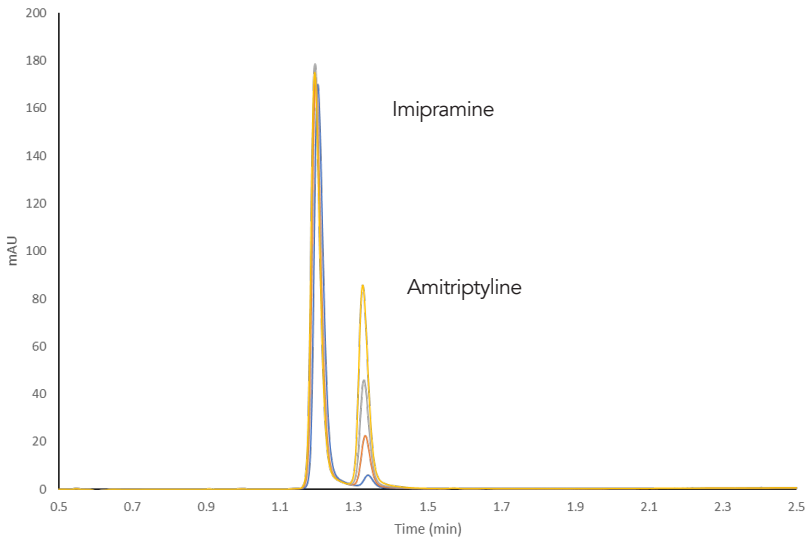
Built upon proven Fused-Core® technology for speed and efficiency, the HALO® PCS column products are positively charged surface chemistries designed to deliver improved peak shapes for basic compounds observed with standard C18 and Phenyl-Hexyl chemistries. Ideal for use with low ionic strength mobile phases, HALO® PCS maintains peak symmetry at higher loading capacities and provides alternate selectivities from other C18 and Phenyl-Hexyl bonded phases. Available in 90 Å pore size for small molecule. The columns are optimized to deliver performance for reproducible, high efficiency LC and LCMS separations.

FEATURES: PCS C18 AND PCS PHENYL-HEXYL for Small Molecule Separations

- Excellent peak shape and increased loading capacity for basic compounds
- UHPLC and LCMS compatible
- Alternate L1 selectivity (PCS C18)
- Alternate L11 selectivity (PCS Phenyl-Hexyl)
- Particle Sizes: Available in 2 µm and 2.7 µm

LOADABILITY ADVANTAGE

Over the range of 0.75 to 15 ng injected on the column, the HALO® PCS Phenyl-Hexyl maintains baseline resolution under formic acid mobile phase conditions.



TEST CONDITIONS:

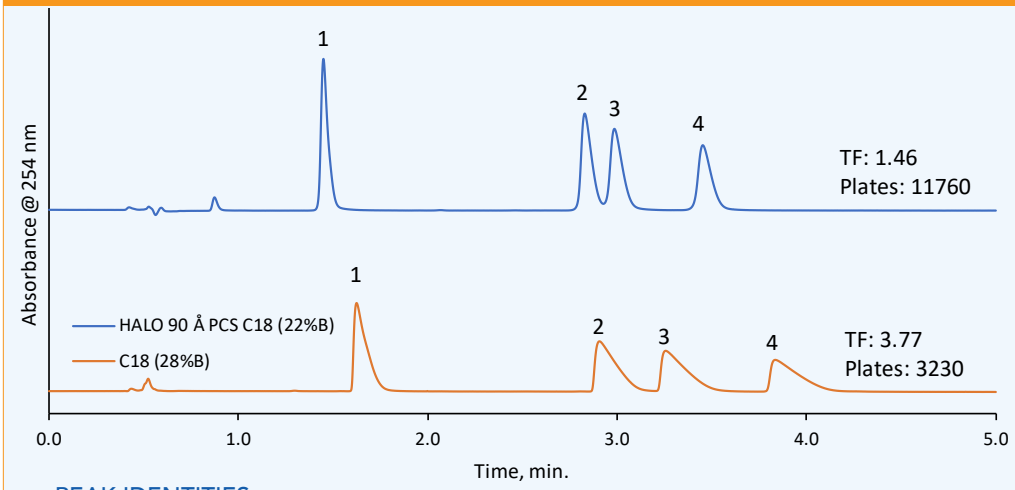
Column: HALO 90 Å PCS Phenyl-Hexyl, 2.7 µm, 2.1 x 100 mm
Mobile Phase A: Water + 0.1% Formic Acid
Mobile Phase B: ACN + 0.1% Formic Acid
Gradient:

Time	%B
0.0	25
3.0	35
3.1	85
3.6	85
3.7	25
5.0	25

Flow Rate: 0.4 mL/min.
Back Pressure: 242 bar
Temperature: 35 °C
Injection: 1.0 µL
Sample Solvent: 75/25 Water/ACN
Wavelength: PDA, 254 nm
Flow Cell: 1 µL
Data Rate: 100 Hz
Response Time: 0.025 sec.
LC System: Shimadzu Nexera X2

SEPARATION USING HALO® PCS C18 COMPARED TO C18

A mix of four antidepressants is separated using the HALO 90 Å PCS C18 column. The positive charged surface (PCS) stationary phase is ideal for basic analytes when using low ionic strength mobile phases such as formic acid. Improved tailing factor and efficiency are observed when compared to a traditional (uncharged) C18 stationary phase.



TEST CONDITIONS:

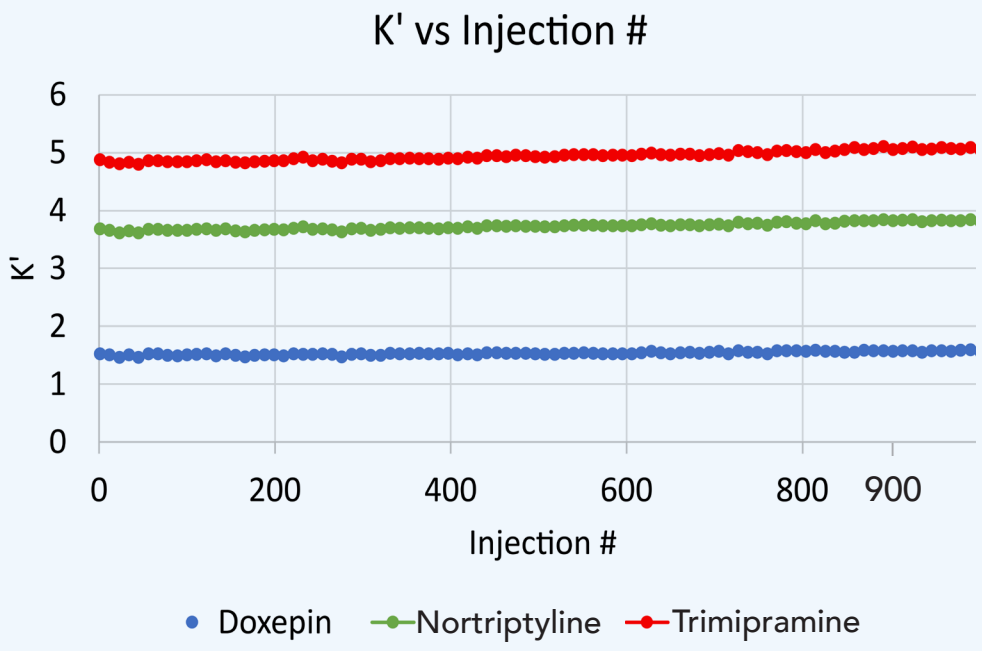
Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm
Part Number: 92812-617
Column: C18, 2.7 µm, 2.1 x 100 mm
Mobile Phase A: Water, 0.1% Formic Acid
Mobile Phase B: Acetonitrile, 0.1% Formic Acid
Isocratic: HALO® PCS C18: 22 %B C18: 28 %B
Flow Rate: 0.4 mL/min.
Back Pressure: 242 bar
Temperature: 30 °C
Injection: 0.5 µL (31 µg)
Sample Solvent: 75/25 Water/ACN
Wavelength: PDA, 254 nm
Flow Cell: 1 µL
Data Rate: 40 Hz
Response Time: 0.05 sec.
LC System: Shimadzu Nexera X2

PEAK IDENTITIES:

1. Doxepin
2. Nortriptyline
3. Amitriptyline
4. Trimipramine

STABILITY

Panel of antidepressants screened with **900 injections** demonstrating the excellent stability of HALO® PCS C18.

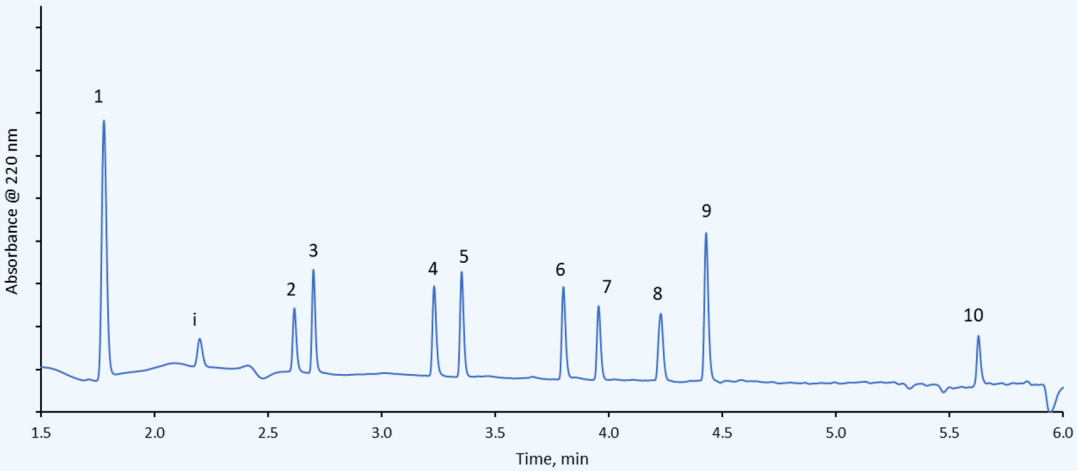


TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm
Part Number: 92812-617
Mobile Phase:
A: Water, 0.1% Formic Acid
B: Acetonitrile, 0.1% Formic Acid
Isocratic: 20 %B
Flow Rate: 0.6 mL/min.
Back Pressure: 244 bar
Temperature: 60 °C
Injection: 0.5 µL
Sample Solvent: 80/20 Water/ ACN
Wavelength: PDA, 254 nm
Flow Cell: 1 µL
Data Rate: 40 Hz
Response Time: 0.025 sec.
LC System: Shimadzu Nexera X2

RAPID SEPARATION OF BETA BLOCKERS WITH EXCELLENT RESOLUTION

Using a 2 µm HALO® PCS C18 column with UV detection and an MS-compatible mobile phase, ten different beta blockers are cleanly separated in under 6 minutes. The 150 mm column delivers sharp resolution and rapid elution of all peaks, ensuring efficient analysis in a short run time.



PEAK IDENTITIES:

1. Atenolol
2. Pindolol
3. Nadolol
4. Metoprolol
5. Acebutolol
6. Oxprenolol
7. Bisoprolol
8. Labetalol
9. Propranolol
10. Carvedilol

i = impurity in bisoprolol

TEST CONDITIONS:

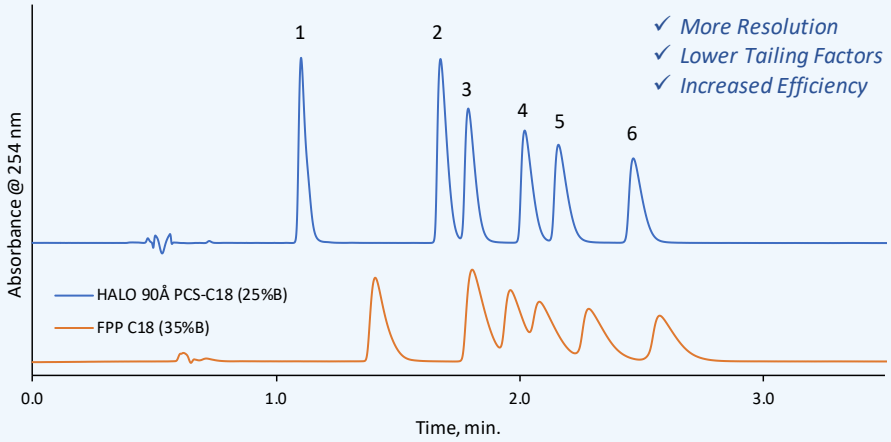
Column: HALO 90 Å PCS C18, 2.0 µm, 2.1 x 150 mm
Part Number: 91882-717
Mobile Phase A: Water, 0.1% Formic Acid
Mobile Phase B: Acetonitrile, 0.1% Formic Acid
Gradient Separation:

Time:	%B
0.00	3
5.00	36
6.50	100
7.50	100
8.00	3
12.00	3

Flow Rate: 0.4 mL/min.
Back Pressure: 599 bar
Temperature: 30 °C
Injection: 2.0 µL
Sample Solvent: 93/7 Water/ACN
Wavelength: PDA, 220 nm
Flow Cell: 1 µL
Data Rate: 40 Hz
Response Time: 0.1 sec.
LC System: Shimadzu Nexera X2

HIGH SAMPLE LOADING DUE TO THE FUSED-CORE® ADVANTAGE

As shown in this basic drug panel of antidepressants, the HALO® Fused-Core® PCS technology tolerates a higher sample load of basic compounds compared to the competitor fully porous C18 column. The positive charged surface (PCS) stationary phase is ideal for basic analytes when using low ionic strength mobile phases such as formic acid.



PEAK IDENTITIES:

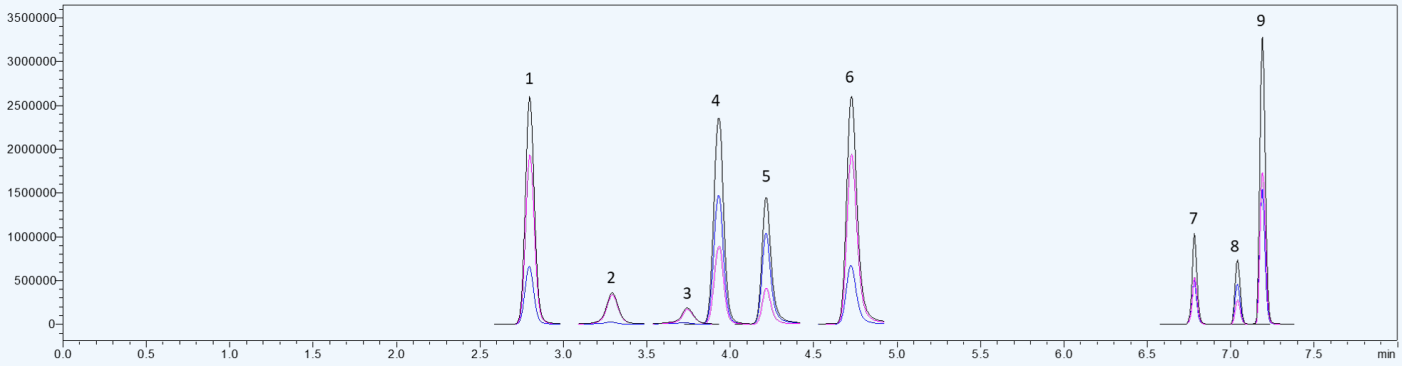
1. Doxepin
2. Desipramine
3. Imipramine
4. Nortriptyline
5. Amitriptyline
6. Trimipramine

TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2.7 µm, 2.1 x 100 mm
Part Number: 92812-617
Competitor Column: FPP C18, 3 µm, 2.1 x 100 mm
Mobile Phase A: Water, 0.1% Formic Acid
Mobile Phase B: Acetonitrile, 0.1% Formic Acid
Isocratic: HALO® PCS C18: 25 %B
FPP C18: 35 %B
Flow Rate: 0.4 mL/min.
Back Pressure: 267 bar
Temperature: 35 °C
Injection: 0.5 µL (40 µg)
Sample Solvent: 75/25 Water/ ACN
Wavelength: PDA, 254 nm
Flow Cell: 1 µL
Data Rate: 100 Hz
Response Time: 0.025 sec.
LC System: Shimadzu Nexera X2

LC-MS ANALYSIS OF ANTIBIOTICS USING 2µm HALO® PCS C18

A mixture of 9 antibiotics from 5 different classes is separated using a 2 µm HALO 90 Å PCS C18 column. The PCS C18 phase was selected since it gives improved peak shape for basic compounds over traditional phases when run using low ionic strength mobile phase conditions, such as formic acid. One explanation for the improved peak shape at higher loading is that on the PCS phase, the limited density of the fixed surface positive charge, and its anionic partner, reduces the surface overload effect on the analytes.



TEST CONDITIONS:

Column: HALO 90 Å PCS C18, 2 µm, 2.1 x 50 mm
Part Number: 91882-417
Mobile Phase A: Water/0.1% formic acid
Mobile Phase B: Methanol/0.1% formic acid

Gradient:

Time	%B
0.00	6
5.50	19
6.00	64
8.00	95
8.01	6
12.00	6

Flow Rate: 0.4 mL/min.
Pressure: 300 bar
Temperature: 27 °C
Injection Volume: 0.5 µL
Sample: 0.2 - 17 µg/mL
Sample Solvent: 98/2 water/methanol
LC System: Shimadzu Nexera X2

MS CONDITIONS:

System: Shimadzu 8060
Detection Mode: DUIS ESI + 1 kV
Nebulizer Gas Flow: 3 L/min
InterfaceTemperature: 150 °C
DL Temperature: 300 °C
Heat Block Temperature: 200 °C
Drying Gas Flow: 5 L/min.

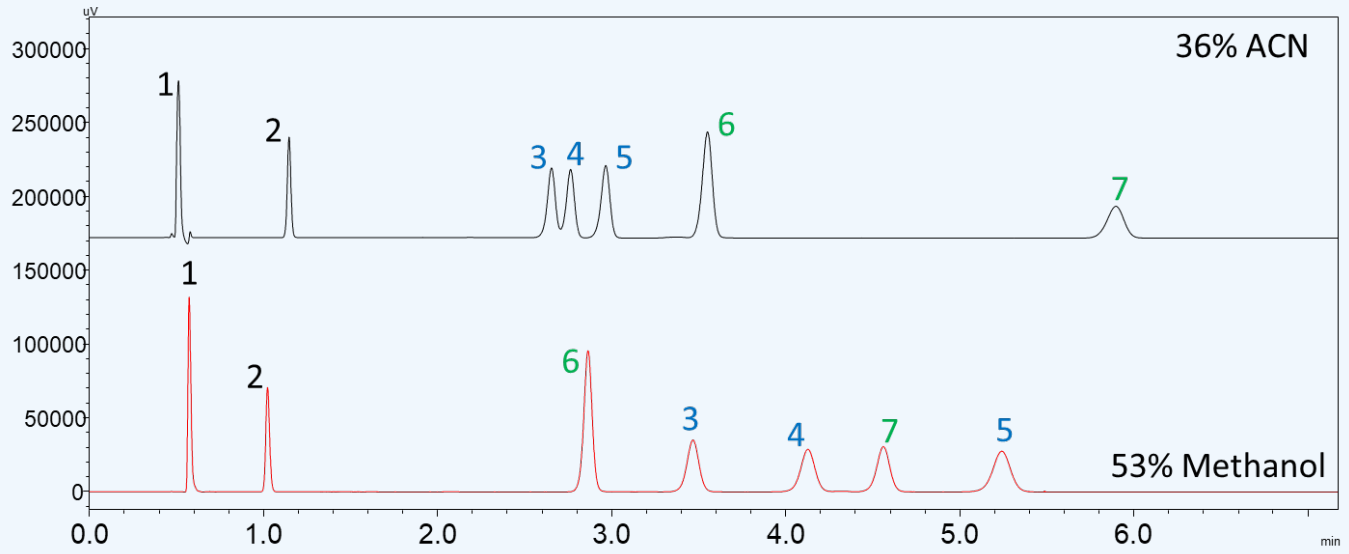
PEAK IDENTITIES:

	Compound	Time
1.	Sulfamerazine	2.80
2.	Tetracycline	3.29
3.	Oxytetracycline	3.74
4.	Sulfamethazine	3.93
5.	Ciprofloxacin	4.22
6.	Enrofloxacin	4.73
7.	Erythromycin	6.78
8.	Penicillin G	7.04
9.	Oxacillin	7.19

Peak #	Compound	Retention Time (min)	Precursor m/z	Product m/z	Collision Energy	Peak #	Compound	Retention Time (min)	Precursor m/z	Product m/z	Collision Energy
1	Sulfamerazine	2.80	265.18	92.10	20	6	Enrofloxacin	4.73	360.10	316.38	25
				156.22	30					342.39	25
2	Tetracycline	3.29	445.20	410.26	35	7	Erythromycin	6.78	734.68	158.18	20
				427.80	30					576.49	15
3	Oxytetracycline	3.74	461.10	426.43	35	8	Penicillin G	7.04	335.17	160.16	30
				443.67	30					176.03	25
4	Sulfamethazine	3.93	279.00	92.21	30	9	Oxacillin	7.19	402.40	160.25	15
				124.31	25					243.24	15
5	Ciprofloxacin	4.22	332.00	288.21	25						
				314.32	25						

EFFECT OF ORGANIC MODIFIER ON HALO® PCS PHENYL-HEXYL

By using methanol with HALO® PCS Phenyl-Hexyl, the pi-pi interactions are enhanced between the analytes and the phenyl stationary phase, resulting in increased retention for peaks 3, 4, and 5 (bases) and decreased retention for peaks 6 and 7 - (neutrals).



TEST CONDITIONS:

Column: HALO 90 Å PCS Phenyl-Hexyl, 2.7 µm, 2.1 x 100 mm
Mobile Phase A: Water/ 0.1% Formic Acid
Mobile Phase B: ACN or Methanol/ 0.1% Formic Acid

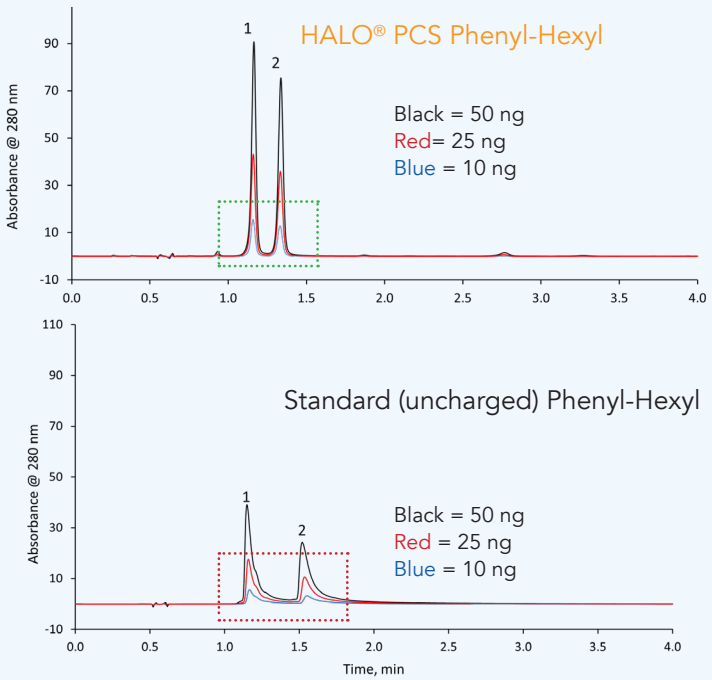
Isocratic: 36(ACN)/53(Methanol) %B
Instrument: Nexera
Injection: 0.5 µl Benzo QA Mix
Temperature: 30 °C
Flow Rate: 0.4 mL/min.

PEAK IDENTITIES:

1. Uracil
2. Phenol
3. Oxazepam
4. Flunitrazepam
5. Diazepam
6. 1-chloro-4-nitrobenzene
7. Naphthalene

PEAK SHAPE IMPROVEMENT & LOADABILITY WITH HALO® PCS PHENYL-HEXYL

HALO® PCS Phenyl-Hexyl shows sharp, symmetrical peaks from 10-50 ng of each tetracycline antibiotic injected on the column. The peak widths are 50% smaller with HALO® PCS Phenyl-Hexyl compared to standard Phenyl-Hexyl.



PEAK IDENTITIES:

1. Oxytetracycline
2. Tetracycline

TEST CONDITIONS:

Column: 2.7 µm, 2.1 x 100 mm phase as labeled
Mobile Phase A: Water/ 0.1% Formic Acid
Mobile Phase B: Acetonitrile/ 0.1% Formic Acid
Isocratic:
12 %B HALO® PCS Phenyl-Hexyl
18 %B SPP Phenyl-Hexyl
Flow Rate: 0.4 mL/min.
Instrument: Nexera
Injection: 0.2, 0.5, 1.0 µL (10,25,50 ng)
Temperature: 35 °C

PRODUCT CHARACTERISTICS

ATTRIBUTE	90 Å PCS C18	90 Å PCS Phenyl-Hexyl
Ligand	dimethyloctadecylsilane	6-phenylhexyldimethylsilane
Particle Size (µm)	2.0, 2.7	2.7
Pore Size (Å)	90	90
USP #	L1	L11
Carbon Load (%)	7.4	6.1
Surface Area(m^2/g)	125	125
Endcapped (Y/N)	Yes	Yes
Low pH Limit/Max T	2/60 °C	2/60 °C
High pH Limit/Max T	7/40 °C	7/40 °C
100% Aqueous Compatible	Yes	Yes

PART NUMBERS

Dimensions: ID x Length (in mm)	90 Å PCS C18 (2.7 µm)	90 Å PCS C18 (2.0 µm)	90 Å PCS Phenyl-Hexyl (2.7µm)
1.5 x 50	9281X-417	9188X-417	9281X-418
1.5 x 100	9281X-617	9188X-617	9281X-618
1.5 x 150	9281X-717	9188X-717	9281X-718
2.1 x 20		91882-217	
2.1 x 30		91882-317	
2.1 x 50	92812-417	91882-417	92812-418
2.1 x 100	92812-617	91882-617	92812-618
2.1 x 150	92812-717	91882-717	92812-718
2.1 x 250		91882-917	
3.0 x 30		91883-317	
3.0 x 50	92813-417	91883-417	92813-418
3.0 x 100	92813-617	91883-617	92813-618
3.0 x 150	92813-717	91883-717	92813-718
3.0 x 250		91883-917	
4.6 x 50	92814-417		92814-418
4.6 x 100	92814-617		92814-618
4.6 x 150	92814-717		92814-718
4.6 x 250	92814-917		92814-918

HALO® GUARD COLUMNS 3 PACK			
Dimensions: ID x Length (in mm)	90 Å PCS C18 (2.7 µm)	90 Å PCS C18 (2.0 µm)	90 Å PCS Phenyl-Hexyl
2.1 x 5	92812-117	91882-117	92812-118
3.0 x 5	92813-117	91883-117	92813-118
4.6 x 5	92814-117		92814-118
Guard Column Holder	94900-001		

INNOVATION YOU CAN TRUST – PERFORMANCE YOU CAN RELY ON

HALO®

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